# EWF Special Course

# EUROPEAN LASER SAFETY OFFICER

## Minimum Requirements for the Education, Training, Examination and Qualification

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**MINIMUM REQUIREMENTS FOR THE EDUCATION, TRAINING, EXAMINATION AND QUALIFICATION**

# Special Course:

# EUROPEAN LASER SAFETY OFFICER (ELSO)

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**Table of Contents**

**MINIMUM REQUIREMENTS FOR THE EDUCATION, TRAINING, EXAMINATION AND QUALIFICATION OF PERSONNEL**

# 1 INTRODUCTION

## 1.1 Guideline Structure

Chapter 2 provides an overview of the guideline content.

Chapter 3 of the guideline covers the minimum requirements for education and training. Students having successfully completed modules 1 and 2 of this course and passed the relevant examination will be expected to be capable of applying the technology required in laser safety officer as covered by this guideline.

The contents are given in the following structure (overview):

Module

| | |
|---|---|
| 1: Basics of laser technology | 12 |
| 2: Laser safety officer | 16 |

A “teaching hour” shall contain at least 50 minutes of direct teaching. It is not obligatory to follow exactly the order of the topics given in this guideline and choice in the arrangement of the syllabus is permitted. The dept to which each topic is dealt with is indicated by the number of hours allocated to it in the guideline.

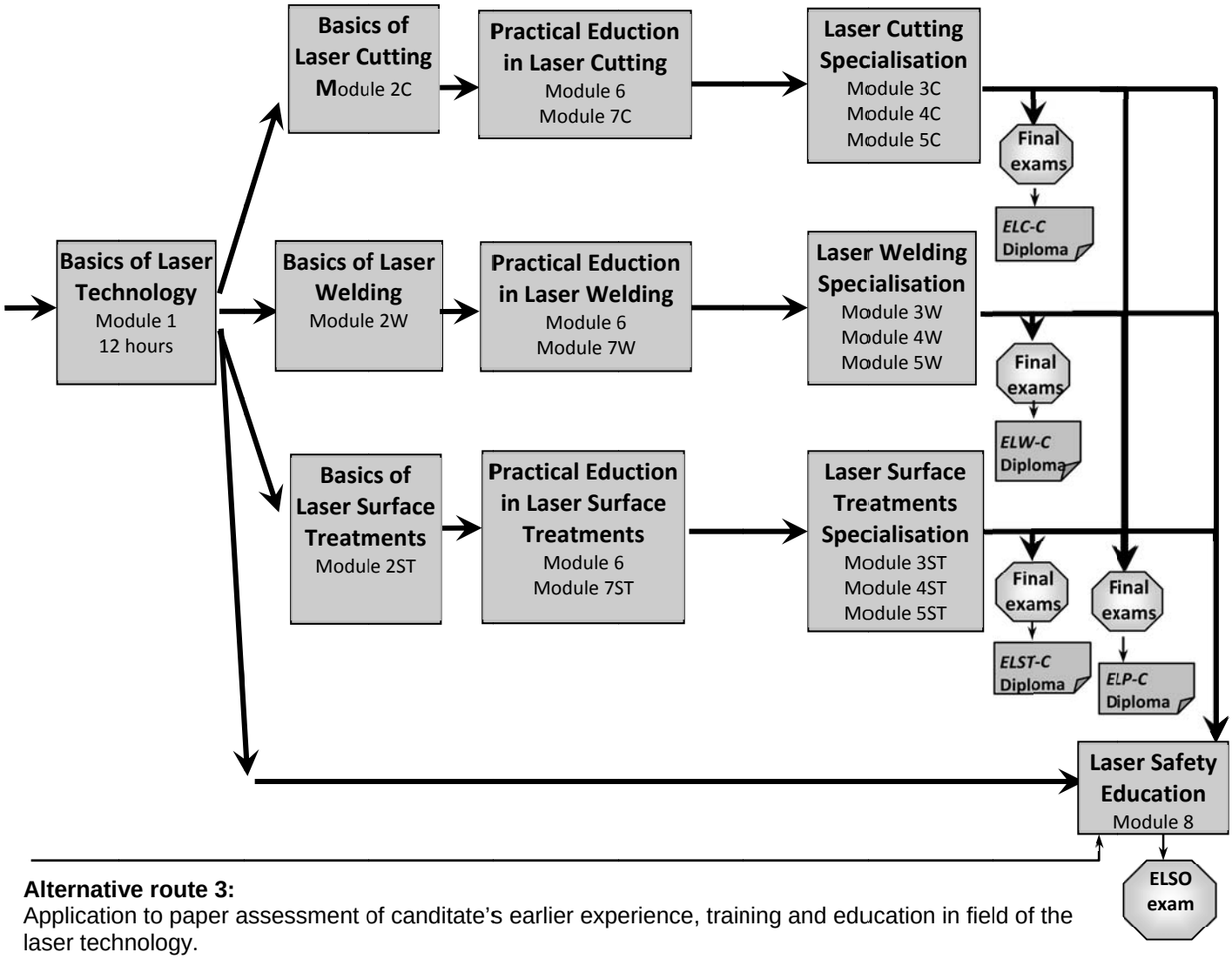
Chapter 4 of the guideline covers the rules for examination and qualification.

## 1.2 General Access Conditions

No access conditions apply, but experience in laser processing field (cutting, welding, etc) or allied activities for at least one year is recommended.

## 1.3 Standard and alternative routes to European Laser Safety Officer education.

The European Laser Safety Officer (ELSO) is an individual designated by the employer with the authority and responsibility to effect the knowledgeable evaluation and control of laser hazards, and to monitor and enforce the control of such hazards. Training of Modules 1 and 2 gives the minimum education for acting as an ELSO.




**Alternative route 3:**
Application to paper assessment of canditate's earlier experience, training and education in field of the laser technology.

**Diagram 1**. Routes to European Laser Safety Officer qualification.

The standard route 1 is for participants which like to take part to full ELP education and like to get a specific diploma.

The standard route 2 is for participants which like to take part to education described in this guideline.

The Alternative Route is aimed at individuals who may already have experience of the job function at a particular level without holding the appropriate qualification diploma. These individuals will have already gained full or part knowledge of the syllabus defined in this guideline and can demonstrate their capability to proceed to examination either directly without compulsory attendance at an ANB approved training course or by attending only part of such a course.

## 2 COURSE CONTENT OVERVIEW: THEORETICAL AND PRACTICAL EDUCATION

| | Hours |
|---|---|
| **THEORETICAL EDUCATION** | |
| **Module 1: BASICS OF LASER TECHNOLOGY** | **12** |
| M 1.1 Presentation of the program and introduction to laser techniques | 2 |
| M 1.2 Principles of laser emission and key laser parameters | 3 |
| M 1.3 Laser types, beam propagation and guiding between output and work piece | 4 |
| M 1.4 Laser systems and equipment | 3 |
| **Module 2 LASER SAFETY OFFICER** | **16** |
| M 2.1 Laser safety officer | 16 |

## 3 THEORETICAL AND PRACTICAL EDUCATION (COURSE SYLLABUS )

### 3.1 Module 1: Basics of laser technology 12

#### 3.1.1 Presentation of the program and introduction to laser techniques 2

***Objective:***
The students will understand key terms and abbreviations and be acquainted with basic laser types and techniques.

***Scope:***
Definitions and terminology related to:

- content of the guideline
- basic types of laser
- basic types of laser processes
- laser applications

***Learning Outcomes:***
Understand the terminology and definitions which are used in this course.
Classify various laser types based on proper terminology.
Classify various types of laser processes based on proper terminology.

#### 3.1.2 Principles of laser emission and key laser parameters 3

***Objective:***
The students will be acquainted with laser emission.

***Scope:***

- laser as light
- wavelength
- resonators structure and operational principle
- laser parameter overview

***Learning Outcomes***
Explain the generation of laser light.
Explain the properties of laser beam.
Understand suitable wavelengths used in different laser applications and different materials.
Explain the optical components in laser system

#### 3.1.3 Laser types and beam transfer between the output window and the work piece 4

***Objective:***
To understand how different kind of laser types work and how the beam guidance is done in those systems

***Scope:***
Laser types

- $CO_2$-laser
- Nd:YAG-laser
- Diode-laser
- Fiber-laser
- Disc-laser

- Excimer laser

Beam Characteristics

- Propagation
- Focusability
- Power density distribution

Beam transfer

- Mirrors and lenses
- Scanning optics
- Fiber
- Beam quality and beam control / observation

***Learning Outcomes:***

Explain the working principles of the most common laser types.
Explain difference between laser types.
Explain the structure of laser types.
Understand the basic reasons for different types of laser beam delivery method
Explain the basics of beam properties, manipulations and guidance.

3.1.4 **Laser material processing systems and equipment** **3**

***Objective:***

The student will be introduced to use and identify laser systems and internal & external equipment.

***Scope:***

- Laser work stations
- Gases in laser processes
- Optional accessories
- Most relevant laser beam parameters
- Beam guiding and focusing optics
- Welding fixtures

***Learning Outcomes:***

Explain the basics of the most common laser work stations.
Understand the basics of the gases and fumes which are used or formed in laser processes.
Understand the additional value of optional accessories.
Explain most common optional accessory in laser systems.
Explain most relevant laser beam parameters
Explain proper selection of welding fixtures
Explain the method for choosing most suitable focusing optics for different laser processes

## 3.2 Module 2: Laser safety officer

**Laser safety officer** **16**

***Objective:***
The module (together with the module 1) is designed to provide the student with the knowledge required to perform the duties of Laser Safety Officer as described in standard EN 60825.

***Scope:***

By completion of the module the student will know
- effects of lasers have on the eye and skin
- the hazard analysis
- EN standard and other safety regulations associated with lasers
- the effects of non-beam hazards
- how to set up a laser safety program

***Learning Outcomes:***
- Understands the risks and hazards in laser processing
- Is able to prepare the hazard analysis
- Understands the safety standards

# 4 EXAMINATIONS

## 4.1 Introduction

This guideline seeks to achieve harmonization of examination and qualification of personnel involved in the operation of the laser technology field in the European territory. The national organizations, being members of EWF, mutually acknowledge the record of achievements awarded in any member Country to laser safety officer personnel following examination conducted in accordance with this guideline.

Education must have followed this EWF guideline and the examination must have been conducted by the Authorized National Body.

## 4.2 Examination procedures and administration

Procedures and administration are covered by Document EWF416 (see latest edition).

## 4.3 Approval of the training course

Any training course leading to the EWF examination shall be approved by the Authorized National Body. The number of teachers required to give the course shall be sufficient to ensure that the essential specialist knowledge and industrial experience to cover the syllabus is adequately represented in the team of teachers and visiting lecturers.

## 4.4 Examination Board

An examination Board, acting on behalf of the ANB supervises the examination therefore independence, integrity and fairness of the examination system are maintained.

## 4.5 Admission to the examination

Admission to the examination leading to the award of the laser safety officer record of achievements will be restricted to those:

a) who comply with the minimum requirements specified in the directory of the access conditions, and
b) who have attended at least 90% of the course, approved by the ANB, according to this guideline, exceptions are at the ANB discretion.

## 4.6 Examination procedures in European Laser Safety Officer education

The examination procedures described below are designed to test the candidate's knowledge and understanding of different situations in laser safety officer's activities in industry. There will be written examinations which have a series of multiple choice questions and essay questions in each of the following modules:

Module 1: Basics of laser beam technology, 12 h training
Module 2: Laser safety education, 16 h training

The time devoted to the written examination shall be a minimum of 0,75 hours per module. There has to be questions from both modules. The questions are to reflect the course topics. However, the total examination time shall be a minimum of 2 hours. Although the candidate has gone thru the alternative

route and he/she has accepted by paper assessment to module 2 education, he/she has to take part to full examination (both modules 1 and 2).

### 4.7 Evaluation of performance

In order to pass the examination the candidates shall achieve at least 60 % of the maximum possible mark examination.

The examination for all applicable modules shall be completed within a period of 3 years from the date of the first examination.

### 4.8 Re-examination and appeals procedure

Failure in any individual module of the examination shall require re-examination only in the module failed. Examinations shall be retaken within 2 weeks to 15 months of the initial examination and, in the case of a second failure, one further attempt is permitted within 1 to 15 months from the date of the second examination. Failure of this third attempt will result in the candidate being treated as an initial candidate and a retake of the whole course will be required.
Candidates who feel they have been unfairly treated during the examination procedure have the right to appeal to the Authorized National Body.

### 4.9 European laser safety officer record of achievement

After successful examination the applicable is a record of achievement awarded to the candidate by the Authorized National Body.